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(54) Abstract Title

Remote control for energy saving

(57) Energy is saved by switching electrically powered appliances off when not required under the control of radio signals transmitted from a remote location. The radio signals represent ON or OFF alternatively and each appliance has, built into its electrical supply plug and/or a socket therefor, switch means comprising a receiver 52 for the signals. A decoder 54 connected to the receiver 52 determines whether a received signal represents ON or OFF and sets a flip-flop 56 accordingly. An output from the flip-flop 56 is amplified to drive a relay 60 with a pair of contacts which alternatively make and break the live wire L connection to the appliance. The flip-flop latches to hold the setting, and repeated burst signals guard against spurious operation.

Fig 3

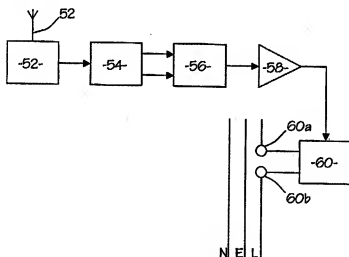


Fig 1

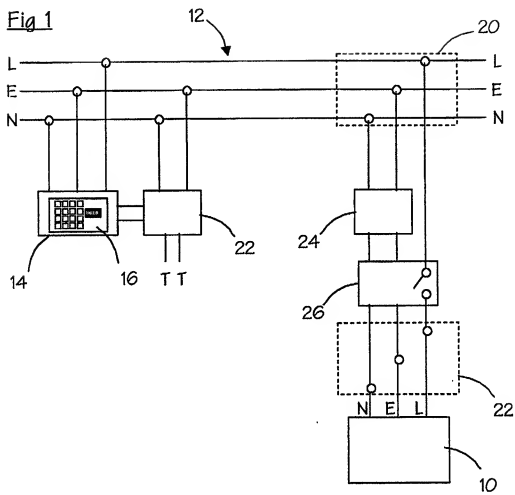


Fig 2

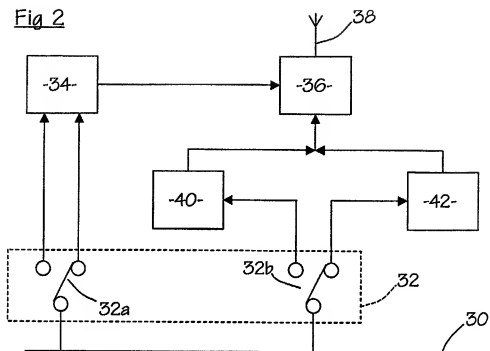
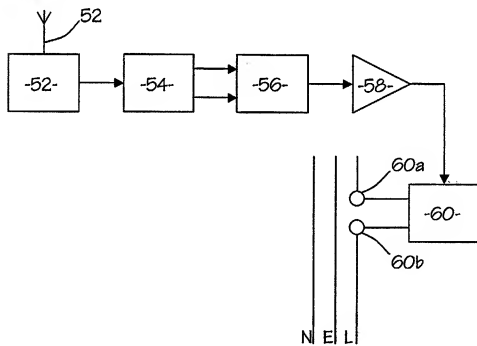


Fig 3



ENERGY SAVING

This invention concerns the control of electrically powered appliances especially but not exclusively for reducing the power consumed thereby. The term
5 "appliance" is used herein to refer to any kind of apparatus connected to an electrical supply, including heaters and coolers, lights and machines.

Many premises, notably factories, shops and offices, contain electrically powered appliances which need to be on for only a portion of each day. A cold
10 drinks dispenser in a factory, for instance, needs to be on (cooling the drinks it contains) during the hours when staff are on the premises, but not when the factory is unoccupied, say at night. The same applies, of course, to hot drinks dispensers and a wide range of other appliances including air conditioning units, space heaters, water heaters, fans, lights and so forth.

Energy and costs are saved if such appliances are switched off when not
15 required. Two known ways of doing this are (a) to appoint somebody to go around the premises and switch the appliances on and off as appropriate and (b) to connect the appliances to the power supply by means of time switches. Both of these approaches have problems, as will now be explained.

Appointing somebody to switch the appliances on and off may be relatively
20 expensive, especially if the person appointed is of a management grade (it being currently common in business for senior staff to be first to arrive and last to leave). It draws that person away from normal duties, which is contrary to good management practice. It calls for additional organisation, particularly in covering for

sickness and holidays. And it presents a practical problem in that many appliances such as drinks dispensers are deliberately arranged to shield access to their connections with the power supply, for safety and to deter tampering. Finally, the person appointed may become neglectful of the task over time, especially if nobody
5 else notices whether or not the task is being properly performed.

The problems outlined above in relation to manual switching may be overcome by the use of time switches, but at the cost of introducing other problems. First, time switches inherently work on a routine, changing from on to off at set times of the day, and thus they do not offer any flexibility with regard to use of
10 premises: they do not, for instance, adapt to early opening or late closing. In any event, time switches need to be reset twice a year, when clocks are seasonally adjusted. Also, unless the time switch is sophisticated enough (and therefore expensive) to be programmable for a whole week, it will treat weekends and holidays as normal working days and an appliance connected to it will be switched
15 on even though the premises are vacant.

Patent Application GB0009962.2 describes a system for controlling powered apparatus in premises, which system comprises switching means for alternatively connecting and disconnecting between the powered apparatus and a substantially constant power supply therefor, said switching means being operable in response to
20 signals transmitted by way of the power supply, wherein said signals are automatically generated when the premises are vacated and reentered.

It is an object of the present invention to provide certain improvements to that system.

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According to a first aspect of the invention there is provided a system for controlling a number of appliances each powered from an electrical supply through a socket fixed in premises and a corresponding plug, wherein the or each socket or the or each plug contains a switch operable in response to signals transmitted from
5 a remote location to switch the respective appliance on an off alternatively.

By "fixed" we refer to a socket which is connected essentially permanently to the electrical supply. It is to be distinguished from a socket which is not so fixed, for instance a so-called trailing socket temporarily connected to an electrical supply by means of an extension lead. The plug corresponding to the fixed socket, though not
10 itself fixed in this sense, is in use not readily moveable because of its attachment to an appliance and its association with the fixed socket.

It is previously known to include a remotely controlled switch in an adapter, that is, a device interconnected between plug and socket. By containing a remotely controlled switch in a plug or (fixed) socket rather than an adapter, the present
15 invention offers two important advantages. First, the switch of the invention is physically secure and unlikely to be lost or stolen. Second, in use it is attached to a particular appliance, deterring its use in possibly hazardous ways, for instance in controlling an electric fire, which cannot safely be switched on remotely because of the risk of fire. It will be understood that the plug can be supplied with warnings
20 against its inappropriate use. Incorporation of the switch in a plug or a socket is also economical as it does not require the additional casing and connections of an adapter.

The control signals may be automatically transmitted when the premises are vacated and reentered.

The system preferably includes a controller for said signals at said remote location and a receiver for said signals operatively connected to the or each switch.

- 5 The controller may be operatively connected to an intruder alarm system for the premises and transmit said signals automatically when the intruder alarm system is armed and disarmed. Alternatively or as well the controller may be operatively connected to a lock for the premises and transmit said signals automatically when the lock is locked and unlocked. Otherwise the controller may be manually operable,
10 and it may be portable.

The control signals may be radio signals, and transmitted at an approved frequency such as in the 433 MHz band.

- The signals are preferably encoded. This has a number of benefits. It guards against malfunctions from unauthorised operation or extraneous spurious signals. It
15 improves reliability, by allowing received signals to be checked. It allows the system to be differentiate from any other similar system in the vicinity. And it allows the system to be partitioned, allowing different appliances to be turned on and off at different times.

- According to a second aspect of the invention there is provided switching
20 means for the system, comprising a switch contained within an electrical plug or an electrical socket and a receiver for signals transmitted from a remote location, the receiver being operatively connected to said switch to switch an appliance powered

through the plug and/or socket on and off alternatively when said signals are received.

The receiver may be mounted in or on the plug or socket containing the switch. In another form the receiver may be mounted in or on the plug when the switch is in the socket, or *vice versa*, and this can provide an additional level of safety and security by restricting a given plug to use with a specific socket.

The invention will now be described by way of example only with reference to the accompanying schematic drawing in which -

Figure 1 is a diagrammatic representation of a system for controlling powered
10 apparatus according to Patent Application GB0009962.2:

Figure 2 is a block diagram of a controller of a system for controlling electrically powered appliances according to the present invention; and

Figure 3 is a block diagram of switching means of a system for controlling electrically powered appliances according to the present invention.

15 The present invention is most readily understood in relation to that of Patent Application GB0009962.2 and accordingly, referring first to Figure 1, this shows a cold drinks dispenser 10 of the kind typically provided on office and other premises for the convenience of staff. The drinks dispenser 10 is powered from a conventional electrical power supply indicated in part at 12 and comprising live (L), earth (E) and
20 neutral (N) wires. Other powered apparatus, not shown for simplicity, may of course be connected to the power supply.

Also powered from the same power supply is an intruder alarm system of which the control box is shown at 14. The alarm system is of conventional form and

As shown in Figure 1, the drinks dispenser 10 is connected to the power supply 12 by switching means which, as will hereinafter be described, is operable in response to the delivery of tones to the earth and neutral wires of the circuit 12. The switching means comprises first connection means 20 engaged with the L, E and N wires, second connection means 22 engaged with the L, E and N wires of the drinks dispenser 10, a tone detector 24 connected to the E and N pins of the first connection means 20 and a relay 26 connected to the tone detector 24. The relay 26 is operable to make and break the L path from the first connection means 20 to the second connection means 22. When a tone from the tone generator 18 is delivered to the E and N wires of the power supply 12, it is detected by the tone detector 24 and this in turn causes the relay 26 to change from make to break or vice versa.

The drinks dispenser 10 is on during normal working hours. During this time the L path to the dispenser 10 is made. At the end of the working day, the last task before the premises are vacated is to arm the intruder alarm system by means of

the control box 14. As the alarm system is armed (say, when the ENTER key is depressed) a tone is generated by the tone generator 18. This tone is delivered to the E and N wires of the power supply 12, where it is detected by the tone detector 24. This changes the relay 26 from make to break, cutting off power from the drinks
5 dispenser 10. Thus the dispenser is off when the premises are empty.

When the premises are reentered (which may be the next morning or at some other time eg after a weekend or holiday) the first task is to disarm the intruder alarm system by means of the control box 14. Again, as the alarm system is disarmed, a tone is generated and detected, the relay 26 returns from break to
10 make and the drinks dispenser 10 is turned on again.

In this way the drinks dispenser is on, and consuming power, only when the premises are occupied, with a consequent saving of electricity and cost. It will be noted that the power supply 12 as a whole is not switched off but remains substantially constant. Thus the intruder alarm (and any other apparatus requiring
15 continuing power from the supply) remains on.

Instead of tones transmitted over mains wiring as described above with reference to Figure 1, the system of the present invention is controlled by way of radio signals, sent from a controller including a transmitter to switching means including a receiver, as will now be described with reference to Figures 2 and 3.

20 Figure 2 illustrates the controller of the present invention. A supply voltage is delivered (from a mains supply by way of a transformer, not shown for simplicity) from a line 30 to both parts 32a and 32b of a two-part, two-position key-switch shown in broken lines at 32. The key-switch 32 is located at a convenient position,

eg adjacent the front door of premises containing the system, and it is manually operable by means of a removable key (not shown).

The key-switch 32 is connected by way of part 32a to an encoder 34 and thence to a first input of a radio transmitter 36 having an antenna 38. The key-
5 switch 32 is also connected, by way of part 32b, to a pair of timers 40 and 42 arranged in parallel, and thence to a second input of the radio transmitter 36. The radio transmitter operates at 433Mhz which, in UK at least, is a frequency band permitted for this use and for which proprietary transmitter and receiver modules are readily available.

10 When the key-switch 32 is set (by means of its key) in a first of its two positions, the encoder 34 generates a signal representing ON for transmission by the transmitter 36. As long as the key-switch 32 stays in this first position the timer 40, which is energised by part 32b in the first position of the key-switch 32, causes the transmitter 36 to transmit the ON signal as a 1s burst every 150s. Similarly, when
15 the key-switch 32 in the second of its two positions, the encoder 34 generates a signal representing OFF for transmission by the transmitter 36, and as long as the key-switch 32 stays in this second position the timer 42, which is similar to the timer 40 but energised by part 32b when the key-switch 32 is in its second position, causes the transmitter 36 to transmit the OFF signal as a 1s burst every 150s.
20 Whenever the key-switch 32 is reset, ie changed by means of its key from its first position to its second position or vice versa, the newly energised timer 40 or 42 triggers an immediate 1s burst of transmission from the transmitter 36, signalling ON or OFF according to the new setting of the key-switch 32.

Thus the controller of Figure 2 signals a change of state as soon as the key-switch 32 is reset and, as is described in more detail below, the system containing the controller switches appliances connected to it on or off at once. A burst of 1s is long enough to distinguish the control signal from extraneous noise or other
5 transmissions, so the system switches reliably. And the repetition of the control signal at 150s intervals cancels any spurious signals, so the system is protected against an incorrect setting.

Figure 3 illustrates the switching means of the present invention. The switching means of Figure 3 is powered from Includes a radio receiver 50, with
10 antenna 52, tuned to receive control signals transmitted (in 1s bursts) from the transmitter 36 of Figure 2. The receiver passes these control signals to a decoder 54 which determines whether each such signal represents ON or OFF and triggers a flip-flop 56 accordingly. The flip-flop 56 has two alternative states corresponding respectively to ON and OFF and includes a latching circuit so that it stays in one
15 state or the other until it receives a contrary signal from the decoder 54. The flip-flop 56 has an output which is thereby latched and this output is amplified by an amplifier 58 to drive a relay 60. The relay has contacts 60a and 60 b in the live wire L of the power supply to an appliance (not shown) such as a cold drinks machine.

The switching means of Figure 3 is contained within an electrical plug of the
20 appliance to be controlled. Those skilled in the art will appreciate that a number of appliances equipped with such plugs may be dispersed around a building to be switched on and off together by means of a single, conveniently located controller.

The use of a removable key to operate the key-switch guards against unauthorised operation.

Various modifications will be apparent to those skilled in the art. For example, the system may be arranged to operate with more than two control signals, so that
5 different appliances can be turned on and off independently. The switch means of Figure 3 may be contained within an electrical socket rather than in a plug, whereby whatever is plugged into that socket may be remotely controlled. (Such use should be subject, of course, to precautions against fire or other hazards which may arise if certain appliances are turned on without a responsible person present. As an
10 alternative, the switch means of Figure 3 may be partitioned so that, say, the relay 60 and its contacts are in a plug and the rest of the controller in a socket, interconnected by way of the earth or neutral, whereby remote switching would be available only through the plug and corresponding socket.)

Another possible modification is to have a portable controller, powered from a
15 battery instead of as described with reference to Figure 2. This offers benefits in both large scale and small scale applications. On a large site one person, such as a security guard on his rounds, can control appliances in a number of buildings. And on a small scale, for domestic application a householder may carry a portable controller and use it to switch on house lights when arriving home, or if disturbed at
20 night.

CLAIMS

1 A system for controlling a number of appliances each powered from an
electrical supply through a socket fixed in premises and a corresponding plug,
5 wherein the or each socket or the or each plug contains a switch operable in
response to signals transmitted from a remote location to switch the respective
appliance on an off alternatively.

2 A system for controlling a number of appliances as claimed in Claim 1
wherein said signals are automatically transmitted when the premises are vacated
10 and reentered.

3 A system for controlling a number of appliances as claimed in Claim 1
or Claim 2 including a controller operable at said remote location to transmit said
signals and a receiver for said signals operatively connected to the or each switch.

4 A system for controlling a number of appliances as claimed in Claim 3
15 wherein the controller is operatively connected to an intruder alarm system for the
premises and transmits said signals automatically when the intruder alarm system is
armed and disarmed.

5 A system for controlling a number of appliances as claimed in Claim 3
or Claim 4 wherein the controller is operatively connected to a lock for the premises
20 and transmits said signals automatically when the lock is locked and unlocked.

6 A system for controlling a number of appliances as claimed in any of
Claims 3 to 5 wherein the controller is manually operable.

7 A system for controlling a number of appliances as claimed in Claim 6
wherein the controller is portable.

8 A system for controlling a number of appliances as claimed in any preceding claim wherein said signals are radio signals.

5 9 A system for controlling a number of appliances as claimed in Claim 8
wherein said signals are transmitted in the 433 MHz band.

10 A system for controlling a number of appliances as claimed in any preceding claim wherein said signals are encoded.

11 A system for controlling a number of appliances as claimed in any
10 preceding claim including a number of said sockets, one for each appliance to be
controlled.

12 A system for controlling a number of appliances as claimed in Claim 11
wherein each socket contains a said switch.

13 Switching means for a system as claimed in any of Claims 1 to 11,
15 which switching means comprises a switch contained within an electrical plug and a receiver for signals transmitted from a remote location, the receiver being operatively connected to said switch to switch an appliance powered through the plug on and off alternatively when said signals are received.

14 Switching means for a system as claimed in Claim 12 including a
20 receiver for signals transmitted from a remote location, the receiver being
operatively connected to a respective switch to switch an appliance powered through
the respective socket on and off alternatively when said signals are received.

15 Switching means as claimed in Claim 13 or Claim 14 wherein the receiver is mounted in or on the plug or the socket containing the switch.

16 Switching means as claimed in Claim 13 or Claim 14 wherein the receiver is mounted in or on the plug or the socket not containing the switch.

5 17 A system for controlling a number of appliances substantially as hereinbefore described with reference to and as shown in the accompanying drawing.

18 Switching means for a system as claimed in Claim 17 substantially as hereinbefore described with reference to and as shown in the accompanying
10 drawing.

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



Application No: GB 0104000.5
 Claims searched: 1,13 & appendancies

Examiner: Mike Davis
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Patents Act 1977 **Search Report under Section 17**

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): G4H (HRCE, HRCM, HRCS)

Int Cl (Ed.7): G08C, H05B

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2325070 A (FOWLER) eg page 2 line 1 to page 3 line 3	1,13 at least
X	GB 2322214 A (SINGH) eg abstract	"
X	GB 2060964 A (SWISH PRODUCTS) whole document	"
X	GB 2036462 A (BASS) eg abstract and page 2 lines 71-80	1 at least
X	GB 2032664 A (HUTTON) whole document	1,13 at least
X	EP 0255580 A2 (QUESTA) whole document	"
X	EP 0089641 A1 (BRUNNQUELL)	"
X	EP 0031874 A1 (VOLL)	1 at least
X	WO 95/02231 A1 (MOE-NILSSEN) eg abstract and page 6 lines 1-3	"

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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